INSTRUMENT TOOL OF BABY GROWTH PORTABLE BASE ON ARDUINO UNO R3

SCIENTIFIC PUBLICATION

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APPROVAL

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....., ... 2018
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Surakarta, 18 July 2018

Author

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Abstrak

Pertumbuhan menjadi parameter utama yang harus dipantau dan diamati oleh setiap orang tua terhadap bayi mereka meliputi tinggi badan dan berat badan bayi untuk mengetahui tingkat kesehatan bayi. Biasanya, bidan atau kader posyandu menggunakan alat ukur secara terpisah, metode ini membuat proses pengukuran menjadi cukup lama dikarenakan pendataan masih bersifat manual. Penelitian ini bertujuan membuat sebuah alat untuk mempermudah kader posyandu atau bidan yang meliputi aspek pengukuran tumbuh kembang bayi. Alat ukur ini menggunakan arduino uno R3 sebagai pemrosesan data dari dua sensor meliputi sensor ultasonik untuk mengetahui tinggi bayi dan sensor berat menggunakan *load cell* dengan hasil data ditampilkan melalui LCD (*Liquid Crystal Display)*. Hasil uji coba pada penelitian ini didapatkan tingkat keakuratan alat yang tinggi dengan presentase tingkat error pengujian pada alat ini mencapai.0 sampai 0,8% pada pengukuran berat badan dan presentase tingkat error 1,1 sampai 2,1% pada pengukuran tinggi badan.

Kata kunci **:** arduino uno, berat badan, loadcell, panjang badan, ultrasonik.

Abstract

Growing up became the main parameter that parents should monitor and watch over on their babies, that includes height and weight to determine the health of the baby. Usually, midwives or medical personnel use a separate measuring instrument, this method makes the process to be long enough because the data collection is still manual. This study aims to make posyandu instrument for cadres or midwives in the aspects of growth measurement for baby. This measurement tool uses arduino uno R3 as data process from two sensors, including ultrasonic sensor to know the height of the baby, weight sensor using *load cell* with the results of data displayed via LCD (Liquid Crystal Display). The Result of this test obtained precision level that high with a percentage error level testing this device from 0 until 0,8 % on weight measurement and percentage error 1,1 until 2,1 % on height measurement.

Keyword: arduino uno, height, loadcell, ultrasonic, weight.

1. INTRODUCTION

Every parent would want their child to grow optimally, that is to achieve the best growth and development. Because growth and development of baby as determinant of success rate of growth and development of baby for next period.

baby growth is the initial process of human life that has a weak and dependent state to the parents. when the baby's body is outside the normal body range of the baby, indicating a health disorder in the baby. While the parameters determine the health of other infants in the form of west body, height, and head circumference (widodo judarwanto, 2012). Baby length

measurement is generally performed in the supine position with the age range of infants 0 to 3 years old. measuring begins after 1 hour after birth by paramedics.

weight and height used are generally separate measuring instruments such as measuring the weight of infants and anthropometry as a baby's length measuring instrument.

This study purposes to make the design of Arduino Uno R3 height, and body weight based on Arduino Uno R3. The data will be displayed using LCD (Liquid Crystal Display). This tool is expected to facilitate the performance of medical personnel in taking data to determine the growth of the baby.

Designing a weight gauge and height, the researcher reviewed several studies on measuring instruments against infants aged 0-3 years who have done before to avoid plagiarism, by providing some research literature as follows:

a. Research conducted by Erwin Tri Effendi, Student of Department of Electrical Engineering Faculty of Engineering - University of Muhammadiyah Surakarta with title Instrumentation of Temperature and Length of Baby Body Based Microcontroller Atmega16. In general, his research made a measuring instrument with temperature parameters and body length of the baby using two types of sensors ie LM35 temperature sensor and ultrasonic length sensor at years 2013.

b. Research conducted by Eko Prasetyo Suryowidodo, Student of Electrical Engineering Department of Faculty of Engineering - Muhammadiyah University of Surakarta with the title of Weight Loss Instrumentation and Atmega16-Based Infant Head. His research made a tool with two parameters using two types of sensors ie Load Cell and sensor sensors measuring the head circumference Ultrasonic sensor with an acceptable maximum distance is 3 m at years 2013.

c. Research conducted by Sholeh Rudi Hartono, Student of Department of Electrical Engineering Faculty of Engineering - University of Muhammadiyah Surakarta with title Design of Temperature Measurement Instrument, Long, Weight, Arduino Mega 2560 at years 2015.

1.1 Problem Formulation

a. How to design a prototype of growth and development of a baby?

b. How can every medical person and community be able to operate this tool?

1.2 Research Goal

The goal of this research is to design prototype of Arduino uno R3 infant based growth measuring instrument which has been equipped with several sensors.

1.3 Research Benefit

This research benefits are:

a. To facilitate medical personnel in measuring the baby's growth and development.

b. Know quickly the results of measurements of growth and development of infants.

2. METHOD

Prepare that do arranging this final project is do study literature,like searching theory reference that appropriate with the problem. The reference like e-book journal,article from internet,etc.

The data that needed in process arranging this final project report is result from measurement height, and weight of the baby. The next process is data analyting with change the result data research as an information that can be used as conclution from the research.

Initial idea that is make a tool for measure height and weight that using modification of plywood box that equipped with ultrasonic sensor on side in box and load cell with HX711 on bottom side in box. Follows this diagram block of circuit.

2.1 Research Stage

a. Literature Journal

Collect research data from various sources such as book,jounal and from internet that can support finishing this research

b. Designing Tool

This designing tool step be divide two step. First step is designing Hardware and Software. Hardware designing is a circuiting step all component to be one device. Software designing is makle program on arduino using C language and design android aplication as smartphone displaying

c. Testing and Getting data

This step doing some testing using doll and testing sensor. Retrieval data done in the following maner.

1. Collect value of sensor that display on LCD
2. Collecting data grow up baby from posyandu

2.2 Flowchart of research

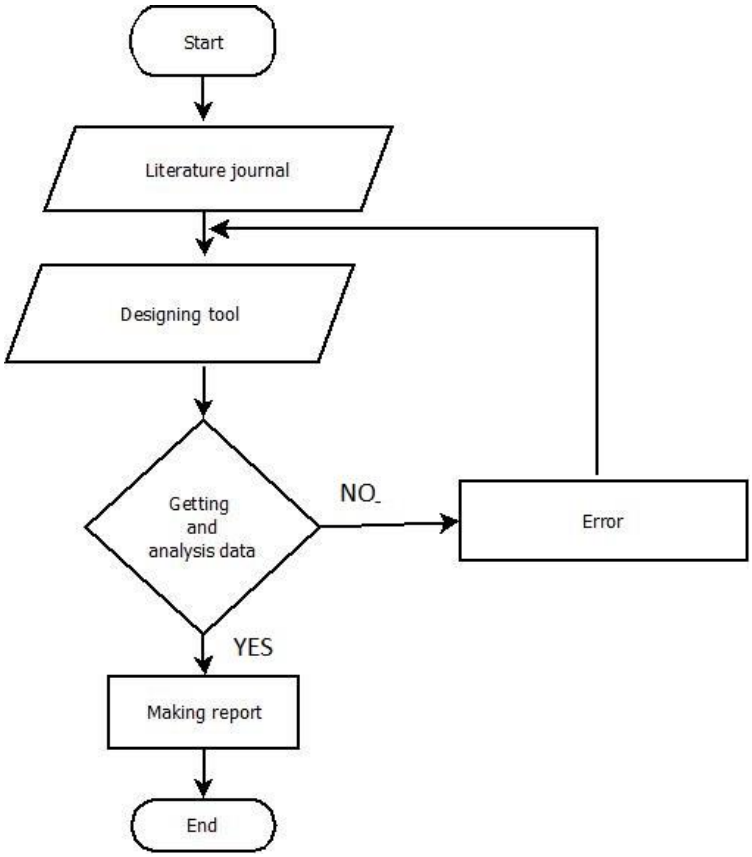

Figure 1.Flowchart System

3. RESULT AND ANALYSIS

Testing tool is done at the Posyandu Mentari addressed in the village Mendungan, Kartasura, Sukoharjo. by comparing the measuring instrument created by the author with the measurement tool used by the posyandu. Posyandu Mentari using the tape measure to measure the length of the baby and the scales bed to measure the weight of the baby.

3.1 Design Box

The design box using material plywood with a thickness 3 mm and dimension 120x50x30. This dimension of box is appropriate babies height that was under 3years with average 50 until 96 cm. The box component compose by Arduino Uno R3, Ultrasonic Sensor, HX711+Load Cell module, Graphic LCD 128x64.

a. Box Design Portable

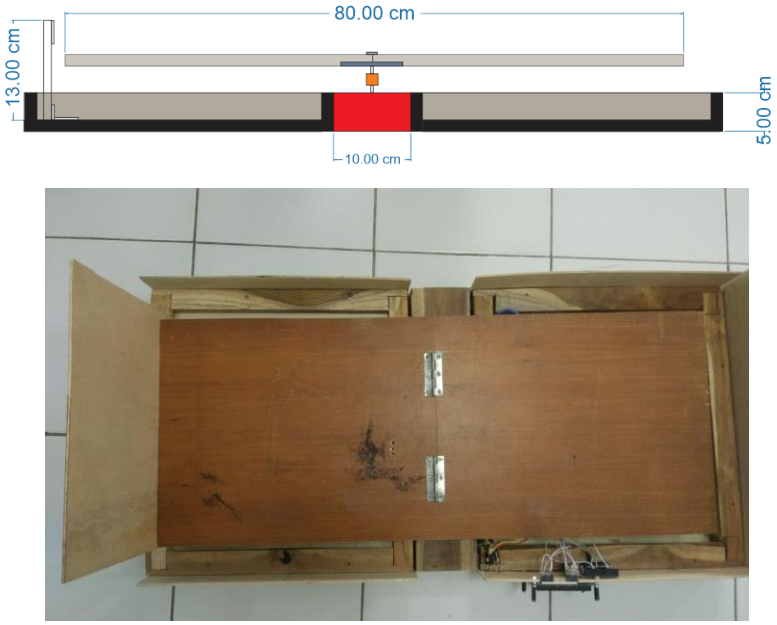

Figure 2. ToolBox Portable

b. Arduino Uno R3

The developing of microcontroller that based ATmega328p chip. This board has function as prototyping microcontroller circuit. With this device we can easier to program system tool.

Figure 3. Arduino Uno R3

c. Ultrasonic sensor

A sensor that has function to changing sound to magnitude electric and opposite. This work principle from reflection a soundwave till can used to meaning distance.

Figure 4. Ultrasonic sensor

d. HX711 and Load cell

Load cell is a sensor tha often used to weight measurement. The load cell arranged from on strain gauge.in this research load cell has function to measure babies weight and HX711 module is a completing load cell in reading measurement of weight. This module has function as amplifier of load cell or converter signal analog to digital. When the load cell be connected with HX711 the microcontroller can read changing bit from load cell. This schematic of HX711 circuit

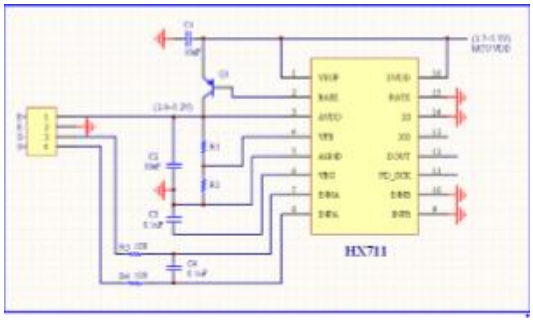

Figure 5. schematic of HX711 circuit

Figure 6. HX711+Load cell module

e. LCD (Liquid Crystal Display)

LCD 128x64 has function to displaying data from sensor that processed by Arduino. This device has display 64 row and 128 coloum or usually called LCD 128x64

Figure 7. Graphic LCD 128x64

3.2 Test Result

1. Arduino Testing

   This step test do with using Arduino IDE software in PC/Laptop that connected with Utrasonic Sensor and HX711 with Load Cell. Where Arduino as processing data from sensor and will be display data on LCD 128x64.

2. Utrasonic Sensor Testing

   This step test with do measuring height an object that connected with Arduino Uno R3 as processing data measurement.

3. HX711+Load Cell module

   This step test with measuring weight an object that connected with Arduino Uno R3 as processing data measurement.

4. Graphic LCD 128x64

   This step test do for ensure data measurement from ultraonic and HX711 with Load Cell can display in LCD 128x64.

3.3 Analysis Circuit Testing

Analysis Testing do knowing the circuit series of overall. If every component function well then the data measuring will be displaying on LCD.

3.4 Result Measuring Box

1. Height Testing

   The test compare result measuring ultasonic sensor with babies gauge. To know height testing using babies gauge as calibration. The result of testing can display in table 4.1

No	Name	Age (years)	Babies gauge (cm)	Ultrasonic sensor (cm)	Difference (cm)	Level of error (%)
1	Zafran	2,5	89	87	2	2,1
2	Alika	1	72	73	1	1,1
3	Rizqi	2	93	95	2	2,1

2. Weight Testing

The test compare result measuring HX711 with Load Cell with babies scale. To know height testing using babies scale as calibration. The result of testing can display in table 4.2

No	Name	Age (years)	Babies scale (kg)	Load cell sensor (kg)	Difference (kg)	Level of error (%)
1	Zafran	2,5	14,3	14,4	0,1	0,8
2	Alika	1	8,3	8,2	0	0
3	Rizqi	2	12,5	12,5	0	0

3. Measurement weight

For weight measurement using formula on similarity 1.

$$\boldsymbol{Weight = Weight\ measurable - offset\ weight} \quad (1)$$

On measurement using kilogram unit in order to precision measurement, using similarity 2.

$$\boldsymbol{Kilogram = weight/24000} \quad (2)$$

Information :

Weight measurable = heavy weight down on the *load cell*

Offset weight =digital value that reading 24000 = Skala bit/kilogram

4. Height measurement

Length of a box reduce sensor distance from object. So based on the equation for measuring height with using ultrasonic like equation 3.

$$\boldsymbol{Height = (87 - sensor\ distance)} \quad (3)$$

Based testing and analysis' we can get conclution that measuring tool babies height and babies weight will facilitate the performance of paramedics. Because display important parameter growing up of babies under 3 years. Although the accuracy impure 100%.

4. CLOSING

Based on the result of study it can be concluted that design need accuracy and accuracy in weight and height, because the baby will be hyperactive than keep quiet so often change results measurement.

This final project has a deficiency when the base of tool uneven because will make error calibration of load cell. The sollution if will using this tool should cultivated so that the base to put this tool flat.

SUGGESTION

Based this final project, Author give suggestion to the parties that want to continue and developing this measurement project are as follows :

1. Designing the box more portable again and using lightweight wood materials.
2. Using four load cell for getting data value that accuracy and precision.
3. Make a database that can easier to knowing baby growth.
4. Need an algorithm to handling motion problem in the length measurement

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